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Socioeconomic and Racial Disparities in Cancer Risk from Air Toxics in Maryland

Benjamin J. Apelberg, Timothy J. Buckley, and Ronald H. White

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Title: Socioeconomic and Racial Disparities in Cancer Risk from Air Toxics in Maryland.

Authors: Benjamin J. Apelberg[1], Timothy J. Buckley*[2], and Ronald H. White[1,3].

[1] Department of Epidemiology, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, 21205.
[2] Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, 21205.
[3] Risk Sciences and Public Policy Institute, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, 21205.

* Address correspondence to T.J. Buckley, Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health, 615 North Wolfe St., Room E6614, Baltimore, MD 21205 USA. Telephone: (410) 614-5750. Fax: (410) 955-9334. Email: tbuckley@jhsph.edu

Running Title: Disparities in air toxics cancer risk in Maryland.

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Abbreviations:

ASPEN – Assessment System for Population Exposure Nationwide
CEP – Cumulative Exposure Project
EPA – U.S. Environmental Protection Agency
HAPEM4 – Hazardous Air Pollution Exposure Model 4
HAPs – Hazardous Air Pollutants
NATA – National Air Toxics Assessment
TRI – Toxics Release Inventory
VOC – Volatile Organic Compound

Abstract

We linked risk estimates from the U.S. Environmental Protection Agency's (EPA's) national-scale air toxics assessment (NATA) to racial and socioeconomic characteristics of census tracts in Maryland (2000 Census) to evaluate disparities in estimated cancer risk from exposure to air toxics by emission source category. In Maryland, the average estimated cancer risk across census tracts was highest from onroad sources (50% of total risk from non-background sources), followed by nonroad (25%), area (23%) and major sources (<1%). Census tracts in the highest quartile defined by the fraction of African-American residents were three times as likely to be high-risk (>90th percentile of risk) than the lowest quartile (95% CI 2.0-5.0). Conversely, risk decreased as the proportion of Whites increased ($p<0.001$). Census tracts in the lowest quartile of socioeconomic position, as measured by various indicators, were 10 to 100 times more likely to be high-risk than the highest quartile. We observed substantial risk disparities for onroad, area, and nonroad sources by socioeconomic measure and onroad and area sources by race. Considerably less evidence of risk disparities was observed from major source emissions. We found a statistically significant interaction between race and income, suggesting a stronger relationship between race and risk at lower incomes. This research (1) demonstrates the utility of NATA for assessing regional environmental justice; (2) identifies an environmental justice concern in Maryland; and (3) suggests that onroad sources may be appropriate targets for policies intended to reduce the disproportionate environmental health burden among economically disadvantaged and minority populations.